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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/507,542	02/18/2000	Joseph K. Davidson	P950	8012

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EXAMINER

GARCIA OTERO, EDUARDO

ART UNIT	PAPER NUMBER
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2123

DATE MAILED: 10/27/2003

6

Please find below and/or attached an Office communication concerning this application or proceeding.

14

Office Action Summary

Application No.

09/507,542

Applicant(s)

DAVIDSON ET AL.

Examiner

Eduardo Garcia-Otero

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 July 2003 and 04 August 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12, 16-19 and 21-24 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-12, 16-19 and 21-24 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION: Non-final Action (second action on the merits)

Introduction

1. Title is: METHOD AND APPARATUS FOR GEOMETRIC VARIATIONS TO INTEGRATE PARAMETRIC COMPUTER AIDED DESIGN WITH TOLERANCE ANALYSIES AND OPTIMIZATION
2. First named inventor is: DAVIDSON
3. Claims 1-12, 16-19, and 21-24 have been submitted, examined, and rejected.
4. Applicant's Amendment, received 7/14/03, amended claims 2-5, 8, 9, 11, and canceled 13-15 and 20, and added 21-24.
5. The pending original claims are 1, 6, 7, 10, 12, and 16-19.
6. Applicant claims priority to U.S. Provisional application serial No. 60/120,961 filed Feb. 19, 1999.
7. This application has been filed with informal drawings, which are acceptable for examination purposes only.
8. The prior Request for Information is satisfied by Applicant's submitted pages, assertions, and amendments.
9. This application is non-final because new rejections are made (35 USC 112) that are not necessitated by IDS or by amendment.

Index

10. **Iannuzzi** refers to US Patent 5,586,052.
11. **Hoppe** refers to US Patent 6,137,492.
12. **Krishnamurthy** refers to US Patent 6,256,039.
13. **Ballas** refers to US Patent 4,800,652.
14. **Carlstrom** refers to US Patent 5,875,264.
15. **Rose** refers to US Patent 5,574,468.
16. **Kedem** refers to US Patent 4,649,498.
17. **Kamiguchi** refers to US Patent 5,549,857.
18. **Kandikjan** refers to "A mechanism for validating dimensioning and tolerancing schemes in CAD systems", by T. Kandikhan et. al., Computer-Aided Design 33 (2001) 721-737.

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19. **Maxey** refers to New Riders' Reference Guide to AutoCAD 13, by Randall A. Maxey et. al., New Riders Publishing, 1995, ISBN 1-56205-237-3, pages 227-229 (DIM), pages 227-284 (DVIEW), 674-679 (TOLERANCE and parallelism).
20. **McGraw-Hill Dictionary** refers to The McGraw-Hill Dictionary of Scientific and Technical Terms, Sixth Edition, by McGraw-Hill Companies, Inc., ISBN 0-07-042313-X, 2003:

barycentric coordinates "The coefficients in the representation of a point in a simplex as a linear combination of the vertices of the simplex."

simplex "An n-dimensional simplex in a Euclidean space consists of $n + 1$ linearly independent points... a triangle with its interior and a tetrahedron with its interior are examples."

APPLICANT'S REMARKS

21. REQUEST FOR INFORMATION-SATISFIED. Remarks page 7-8. The prior Request for Information is satisfied by the documents included with Applicant's Amendment received 7/14/03 and Supplement to Reply received 8/4/03. The Examiner has listed these documents on a form 892 attached to this action.
22. CLAIM INTERPRETATION. Remarks page 8-9. Applicant persuasively asserts that the term "multivariate regional models" can also be regarded as "multidimensional point-spaces", and both can be described as multidimensional solids. Thus, the claim interpretation is consistent, and is maintained.
23. Further, Applicant persuasively asserts that the Claim 20 interpretation is moot because claim 20 has been cancelled.
24. REJECTION UNDER 35 USC 102(b). Remarks page 10-20.
25. CLAIM 1. Regarding Claim 1, Applicant appears to read limitations from the specification into the claim, in order to distinguish the claim from Iannuzzi.
26. Remarks page 11-13. Regarding claim 1 first limitation, Applicant unpersuasively asserts "**tolerance zone... tolerance map**" is not disclosed by Iannuzzi at abstract "input of geometric data representing features of a manufactured part and data representing datums and tolerances for the features". Applicant states "individual tolerance maps (T-Maps) are generated first" and Applicant provides drawings indicating that said T-maps are three dimensional "maps" disclosing the three dimensional effects of interactions by single

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dimensional tolerances. Claim 1 does not explicitly require three dimensional maps. Note that this three dimensional map limitation is introduced explicitly in dependent claim 2 (amended), thus does not appear inherent in claim 1.

27. Similarly, regarding claim 1 second limitation, Applicant Remarks page 13 states “example figure below shows how accumulation of tolerances is computed according to the claimed invention, wherein individual tolerance maps (T-maps) are generated first, followed by Minkowski addition... There is no teaching in Iannuzzi that is in any way similar”. However, claim 1 does not explicitly or inherently contain the limitation “Minkowski addition”.
28. Similarly, regarding claim 1 third limitation, Applicant Remarks page 13 states “To be optimal, a design must meet more than just the minimum requirements”. Iannuzzi appears to disclose this limitation using different but similar terminology: “complete and well formed... revise... more consistent and useful tolerancing plan resulting in higher quality, lower cost”. Also see the discussion of “trade-off” at specification page 9 line 21 to page 10 line 3.
29. Thus, the rejection of claim 1 is maintained. Also see the new 35 USC 112 rejection of claim 1, below.
30. CLAIMS 2-5, 7, 8, 16, 17, 19. The prior rejections are withdrawn due to Applicant’s amendments and persuasive assertions.
31. REJECTIONS UNDER 35 USC 103. Remarks page 20-30. Claims 13-15, and 20 are cancelled. The prior rejections of 6, 9, 10, 11, and 12 are withdrawn due to Applicant’s amendments and persuasive assertions.

35 USC § 112-Second Paragraph-indefinite claims

32. The following is a quotation of the second paragraph of 35 U.S.C. 112: The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
33. **Claims 1-12, 16-19, and 21-23 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite** for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

34. In claim 1, the first limitation states **“representing tolerance zone for each geometric feature of said object by a model with an algebraic form and a geometric form as a tolerance map”**.
35. It is not clear what the distinction is between “algebraic form” and “geometric form”. The specification page 9 line 14 merely states “the local model has both a geometric form for visualization and an algebraic form for statistical analysis”. From the claim language, it appears that the tolerance zone is represented by a model with 2 distinct forms. Further, it is not clear which of these distinct forms is represented as a tolerance map.
36. Note that specification page 10 line 6 states “representing each tolerance zone for each geometric feature of the object by a tolerance map. The tolerance map... is a means to visualize”. Thus, the logical relationship between the claim 1 terms is not clear.
37. Additionally, specification page 49 18 states “The geometric form comprises two kinds of *Tolerance Maps...*”. Emphasis in original.
38. In the specification, the term **“tolerance map”** is defined as “a convex volume whose shape depends on the tolerance type and whose size depends on the tolerance values” at specification page 10 line 8, and “creating a tolerance map in a space of points, each of which is associated with one variational possibility in the tolerance zone” at specification page 10 line 20, and “finite set of multivariate regional models” at specification page 17 line 9. These three definitions do not appear consistent.
39. Also see page 18 line 13, “The local model often leads to two tolerance maps that must be fitted together...”.
40. For comparison purposes, note that Kandikjan page 722 defines “Tolerance zone” as “Region in which the tolerated entity must lie to satisfy the tolerance specifications for a given class. Each tolerance class has a characteristic tolerance zone”.
41. In claim 1, the second limitation states **“computing in said computer interdependencies between said stored maps and interdependencies between submaps of said stored maps to determine how different tolerance zones for said geometric feature affect each other and to determine how different tolerance zones for different geometric features of said object affect each other”**. The term “submaps” is not defined in the specification.

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Submaps are mentioned at page 10 line 10, and line 24 “submaps of the stored maps”, but are not defined.

42. For comparison purposes, note that Kandikjan page 729 discusses “sub-graphs” for “dimensioning and tolerancing validation”. It is not clear whether sub-graphs are related to submaps.
43. In claim 1, the third limitation states “**selecting tolerance conditions for said object to optimize allocation of tolerances**”. Said “optimization” is not defined, but merely mentioned at page 9 line 21 “identify trade-offs and to optimize the allocation of tolerances”.
44. Claims 2-12, 16-19, and 21-23 depend from claim 1, and are rejected for the same reasons as claim 1.

Claim Rejections - 35 USC § 102(b)

45. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action: A person shall be entitled to a patent unless – (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
46. **Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated.**
47. Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Iannuzzi.
48. Claim 1 is an independent claim with 3 limitations
49. **A-representing tolerance zone for each geometric feature of said object by a model with an algebraic form and a geometric form as a tolerance map** is disclosed by Iannuzzi at abstract “input of geometric data representing features of a manufactured part and data representing datums and tolerances for the features”.
50. **B-computing... interdependencies between said stored maps** is disclosed by Iannuzzi at abstract “Relationships are established between the data and degrees of freedom are determined for the part features and tolerances”.
51. **C-selecting tolerance conditions for said object to optimize allocation of tolerances** is disclosed by Iannuzzi at abstract “determine if the tolerance plan defined by a designer is complete and well formed. If it is not, the designer may then revise the tolerance plan to

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provide for a more consistent and useful tolerancing plan resulting in higher quality, lower cost manufactured parts and assemblies”.

Claim Rejections - 35 USC § 103

52. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action: (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.
53. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:
- Determining the scope and contents of the prior art.
 - Ascertaining the differences between the prior art and the claims at issue.
 - Resolving the level of ordinary skill in the pertinent art.
 - Considering objective evidence present in the application indicating obviousness or nonobviousness.
54. **Claims 24 is rejected under 35 U.S.C. 103(a) as being unpatentable.**
55. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Admission (commercial software) in view of Maxey (AutoCAD).
56. Claim 24 is an independent claim with 10 limitations, A-J.
57. **A-geometry engine module E1** is disclosed by Applicant's Admission at specification page 18 “commercial software... a geometry engine (ACIS, e.g. parasolid or DesignBase)”.
58. **B-constraint solver E2** is disclosed by Applicant's Admission at specification page 18 “commercial software... a constraint solver (e.g. D-Cubed DCM, 2D/3D, design sheet or MAPLE)”.
59. **C-geometry definition system M1** is disclosed by Applicant's Admission at specification page 18 “commercial software... a geometry engine (ACIS, e.g. parasolid or DesignBase)”. Note that specification page 45 states “The procedure for creating such a system from commercially available... is well known”.
60. **E-tolerancing module M4** is disclosed by Applicant's Admission at specification page 18 “commercial software... tolerance analysis packages (e.g. Mech. Advantage, VSA-3D)”.
61. **H-tolerance allocation module M6** is disclosed by Applicant's Admission at specification page 18 “commercial software... tolerance analysis packages (e.g. Mech. Advantage, VSA-3D)”.

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- 62. **J-statistical tolerance analysis package E2** is disclosed by Applicant's Admission at specification page 18 "commercial software... tolerance analysis packages (e.g. Mech. Advantage, VSA-3D)".
- 63. Applicant's Admission (commercial software) does not explicitly disclose the additional limitations.
- 64. **D-dimensioning module M2** is disclosed by Maxey page 227 "dimensioning mode".
- 65. **F-global visualization module M3** is disclosed by Maxey page 277 "dynamic view".
- 66. **G-a D&T [datum and targets] Schema Advisor module M5** is disclosed by Maxey page 675 "geometric dimensioning and tolerance control frames".
- 67. **I-local module visualization module M7** is disclosed by Maxey page 277 "dynamic view".
- 68. **At the time** the invention was made, it would have been obvious to a person of ordinary skill in the art to use Maxey to modify Applicant's Admission.
- 69. One of ordinary skill in the art would have been motivated to do this because Maxey (AutoCAD) serves as a modeling platform upon which to add commercial software modules for constraint, geometry, and tolerance.

Patentable material

- 70. At present, the Examiner believes that this application contains substantial potentially allowable material. Specifically, the specification discusses certain complex interactions between tolerances which are not disclosed in the prior art of record. However, the claims must be written clearly, and must comprise at least one of said complex interactions.

Conclusion

- 71. All claims stand rejected, and this action is non-final.
- 72. Claims 1-12, 16-19, and 21-23 are rejected under 35 U.S.C. 112.
- 73. Claim 1 is rejected under 35 USC 102(b).
- 74. Claim 24 is rejected under 35 USC 103.

Communication

- 75. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eduardo Garcia-Otero whose telephone number is 703-305-0857. The examiner can normally be reached on Monday through Thursday from 9:00 AM to 8:00 PM. If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor,

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Kevin Teska, can be reached at (703) 305-9704. The fax phone number for this group is 703-872-9306.

76. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the group receptionist, whose telephone number is (703) 305-3900.

* * * *

Mayphan
Patent Examiner
Thai Phan
AU 2123